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ABSTRACT

Hypermedia was used to foster constructivism in science and mathematics learning in K-12 settings. It was hypothesized that students might more readily use primary information sources and texts if the goal were to create a hypermedia program. A consortium was formed of K-12 schools in central Iowa, their Area Education Agency (AEA), and the College of Education at Iowa State University, and 12 schools were chosen to participate in a project entitled Empowering Students with Multimedia. Inservice sessions were held for teacher/student production teams; teachers served primarily as content advisers and students became program designers. University personnel and AEA collaborators guided teachers and students, conducted inservice sessions, and provided technical advice. In every case, student producers created the program architecture and completed the content treatment for certain portions of the program. The teacher assisted by providing resources and clarifying questions of content. Remaining portions of each program were left in skeleton form so that other students could complete them. Finished programs were used by target students over a 3-month period. Informal comments, observations by teachers, and questionnaire responses from student producers indicated that they felt they learned more about the technology than about the content area, and that they enjoyed working alone or as part of a small design team although the project was time consuming. Teachers expressed enthusiasm for the motivational aspects of this approach. The project was considered successful enough that a second phase was undertaken in 1991-92. (BBM)

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APPLICATION OF CONSTRUCTIVIST THEORY TO THE USE OF HYPERMEDIA

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Background--Constructivists argue that knowledge is constructed only in the mind of the learner, and that good teaching is not necessarily related to good learning. Bodner (1986) states that "until recently, the accepted model for instruction was based on the hidden assumption that knowledge can be transferred intact from the mind of the teacher to the mind of the learner." He goes on to claim that "teaching and learning are not synonymous; we can teach, and teach well, without having the students learn."

The theory holds (Von Glasersfeld, 1979) that constructivism is facilitated by having the learner identify topics or issues, locate resources, plan investigations and activities, practice self-evaluation, and formulate principles. The emphasis is shifted from these activities as those that teachers do, to those that students should perform.

In contrast to widespread emphasis on instructional technology as "tools for teaching" the emphasis in this study was on using technology as a vehicle for learning. Hypermedia was used to foster constructivism in science and mathematics in K-12 settings. Goals of the study included:

- Students and teachers would gain skill in using computer-based technology
- Students would increase their understanding of math and science

Technology was used as a hook to entice students to learn math and science and to provide an alternative to "read-a-book," "write-a-paper," and "take-a-test." It was hypothesized that students might more readily use primary information sources and texts if the goal were to create a hypermedia program. The reason for emphasizing student production was that, to foster constructivism, students need to display what they learn. As one student said, "You <u>really</u> have to know trigonometry if you're going to develop a program about it."

In every case student producers created the program architecture and completed the content treatment for certain portions of the program. The teacher assisted by providing resources and clarifying questions of content. With one or two elements worked out in detail, remaining portions of each program were left in skeleton form so that other students in the class could complete them. The process of completing an element included using scanned diagrams, digitized sound, written material, and selected footage from videodiscs, based on the nature of the math or science concepts being portrayed.

Method--A consortium was formed of K-12 schools in central Iowa, their Area Education Agency, and the College of Education at Iowa State University. Twelve schools were chosen to participate in the project entitled EMPOWERING STUDENTS WITH HYPERMEDIA, extending from September 1990 to April 1991.

Four in-service sessions were held for teacher/student production teams throughout the year to help them develop scenarios for their programs, and to learn how to use Hypercard, Linkway, and Hyperstudio.

Teachers served primarily as content advisors; students became program designers. University personnel and Area Education Agency collaborators guided teachers and students, conducted in-service sessions, and provided technical advice. It was particularly important to teachers that they choose students who had an interest in the content and in the technology, and who were more or less self starters.

Typical projects included "Cells, Tissues, Organs, Organ Systems," "Examining the Sphere, " and "Reactions of Acids and Bases." The computer programs were created to be open-ended, in that other students in the class could add their own information as they studied the concepts. For example, student producers might develop a "lesson" on the heart, and let it serve as a model for other students who might develop a lesson on the liver or the brain.

Classroom teachers served as content specialists and facilitators for their student production teams, but they did relatively little programming. The main role of the teachers was to guide students through the content of mathematics and science and to suggest resources that students could incorporate into the projects.

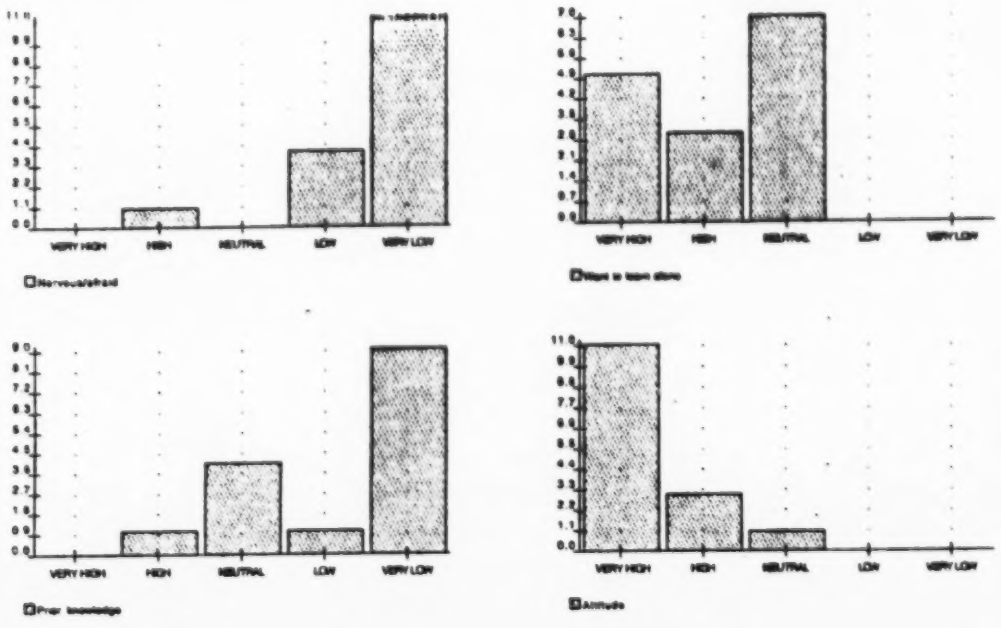
University advisors and Area Education Agency personnel conducted the in-service programs, advised on technical questions, and assisted in purchasing equipment to support the projects.

Field Test--Finished programs were used by target students during the period March through May 1991. Data were collected from those students during that time, as well as from the student producers and their teachers (see instruments below). The response from the 12 cooperating schools was not large, probably for two reasons: (1) the specific subject of the computer-based materials may have been covered previously in the year, and (2) the time period for gathering data coincided with the pressure of other activities at the end of the academic year. Thus, information reported here is anecdotal as well as quantitative.

A total of 35 student users, 3 teachers, and 3 student producers responded to the formal instruments.

Student users

The following 4 charts depict student attitudes toward technology, their fear of it, their level of knowledge before using the materials, and their preference for working on their own.



Selected responses from student users' indicate the degree of constructivism they may have achieved. When asked to compare traditional instruction (books, TV, field trips, etc.) to this experience, students indicated it was more interesting, they liked it better, they felt it was newer and faster, and they could work at their own pace. "You were the one asking the questions and getting the answers," one student said. Some students wanted "...more pictures and more activities." When asked if they would recommend the program to a friend, virtually everyone said yes.

No rigorous determination was made to determine how much content, in this case physical science, was learned, but students did indicate that they observed how chemicals reacted together, and that reactions were different when acids, water, and bases were used. (The program used was based on a videodisc from the American Chemical Society, showing chemical reactions).

Student Producers

Approximately 50 students across the 12 projects served asprogram designers and programmers. Comments gleaned from informal contact with them during the workshops, from observations their teachers made, and from the formal instruments they submitted indicate that they did most of the work themselves, under the supervision of the teacher. They felt they learned more about the technology than about the content area, and that they enjoyed working alone or as part of a small design team. They acknowledged the great deal of time needed to produce the program shell, but--as one student said, "...it made me manage my time." They indicated that the technology-based activities helped the content come alive for them, and that they acquired a working understanding of high technology too.

Teachers

Teachers expressed enthusiasm for the motivational aspects of this approach, claiming that some students who had not shown much interest in either technology or math/science now were much more involved in both. They found that their role, as teachers, was more suited to posing questions, helping students find resources, and monitoring progress. Nearly all teachers recognized the shift from traditional teacher-centered instruction to student-based learning.

Conclusions and Future Work

The project was considered successful enough that a second phase is underway for the 1991-1992 school year. The former participants (both teachers and student producers) are serving as mentors to 8 new schools.
An organizational meeting brought mentors and new participants together, where they spent time planning new work with each other.

Some student producers from the first year have been identified in their school systems as "experts" who are designated to work with both faculty and students in the use of instructional technology. Several teachers have contracted on their own to work with neighboring schools to foster the use of technology by providing inservice workshops.

It appears that the locus of control for education can be shifted to students, and that technology provides a mechanism for that to happen.

- REFERENCES -

Bodner, George M. Constructivism: a theory of knowledge. Jl. of Chem. Ed. Vol. 63, No. 10. Oct. 1986

Von Glasersfeld, Ernst. The concepts of adaptation and viability in a radical constructivist theory of knowledge. In New directions in Piagetian Theory. Irving Sigel, Ed. Lawrence Erlbaum Associates, Hillsdale, New Jersey. 1981.